The Clinic of the Future
Automation in Treatment Planning

Disclosures

Grant support from Varian Medical Systems

Acknowledgements Big Data is a group effort

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Planning comparison of five automated treatment planning solutions for locally advanced head and neck cancer

J. Kraevskaya, M. Zarnikova, S. Okanoyou, M. Patnd, B. Lang-Tantris, Z. Zou, J. Hoekstra, and W. F. A. L. Verhaaf


• Compare Custom and Vendor (Phillips, Varian, RaySearch) Automated Planning for 8 HN Patients

• All meet clinical constraints producing similar quality

• Most completed planning in < 20 min

Radiation Planning Assistant - A Streamlined, Fully Automated Radiotherapy Treatment Planning System


• Automated 3D (cervical) and VMAT (HN)

• HN AutoSegment normal structures

• HN VMAT < 46 min for complete process (i.e. not just optimization)

A risk assessment of automated treatment planning and recommendations for clinical deployment.


• Highest risk steps for automated planning are similar those for manual planning (e.g. marking of isocenter on patient, using correct prescription)

• Many of the highest risk errors in our automated planning workflow were caused by human error.

• Active QA program is essential to catching these errors for both manual and automated planning.
Approach to Safe Integration into Clinical Practice

- Image Registration
- Plan Quality Evaluation
- Automated Segmentation
- Script Based Automated Planning

Be mindful of the whole, when designing approach for each individual component.

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**Beware the half measure**

Do you remember “Computers will reduce the amount of paper that we generate”? 

- Does the automation application fit into your existing process?
- Do you have to make your clinical process more complex to use it?
- Do you have to add equipment/software?
- Is the equipment/software interoperable with your existing system?

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**Beware the imperative to choose**

Sometimes the right answer is none of the above... for now.
What if you are not wary of these risks?

Your reality when you start to look at a new set of commercial automation technologies

- Committed Time
- Uncommitted Time
- Time for Clinical Coverage
- Time for Other ...
- PQI
- Safety Initiatives
- Research
- Admin

What the technology proponents say will happen

- Time to make new technology work in your setting
- Committed Time
- Uncommitted Time
- Time absorbed by new technology

What actually happens because you made unfortunate technology choices

- Be sure to evaluate overall impact on clinical workflow
- Time to make new technology work in your setting
- Time for Other ...
- PQI
- Safety Initiatives
- Research
- Admin

- Committed Time
- Uncommitted Time
- Time absorbed by new technology
Beware the unchecked, easy answer

Near term plan
Integrate automation to practice so that it *augments* your practice quality work flows

![Diagram](image)

This is neutral or reduces risk

Near term plan
Integrate automation to practice so that it *augments* your practice quality work flows

![Diagram](image)

Long Term, with evidence, likely will make sense for some categories of plans

Near Term, without good evidence, risky
Near term plan

Integrate automation to practice so that it augments your practice quality work flows

Plan quality check applications (automated or manual) will be a valuable component for safe implementation of automated planning

Development of Automated Script based planning at University of Michigan

- Complete plan setup as well as optimization
- Statistical DVH based constraints incorporate history
- Overall planning time < 15 min
Comparison of DVH Metrics for Sample of Structures

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Plan Quality Score Card Script

Supports safe implementation of automated planning
Identify plans that are outliers compared to historic data
Historic Data extracted from our ClinicalData Analytics System (named MROAR)

Script driven application for

✓ Electronic Prescription
✓ DVH Constraint Checks

Will support safe implementation of automated planning

Martha Matuszak, PhD
Carlos J Anderson, PhD

BluePrint

Summary

• Script based, automated planning is rapidly becoming widely available in treatment planning systems

• Big advantages for – efficiency, speed to plan, consistency

• For safe implementation, be wary of potential to add complexity or complacency in your clinical work flow processes

Take whole picture view of interrelated technologies

Plan on Scripted Plan Quality + Automated Planning